

Claims

- [c1] A system for selectively heating a fuel cell within a vehicle, said system comprising:
an air compressor; and
a conduit system which is communicatively coupled to and receives compressed air from said air compressor and which is further communicatively coupled to said fuel cell, said conduit system being effective to selectively deliver said compressed air directly to said fuel cell during cold start conditions, effective to heat said fuel cell.
- [c2] The system of claim 1 further comprising:
a heat exchanger which is disposed within said conduit system and which is effective to selectively cool said compressed air; and
a bypass valve which is operatively disposed within said conduit system and which is effective to selectively cause said compressed air to bypass said heat exchanger and to be delivered directly to said fuel cell during cold start conditions, effective to heat said fuel cell.
- [c3] The system of claim 2 further comprising:
a hydrogen gas conduit system which communicates hydrogen gas to said fuel cell; and
a second heat exchanger which is coupled to said conduit system and to said hydrogen gas conduit system and which receives hydrogen gas from said hydrogen gas conduit system, said second heat exchanger being effective to allow said compressed air within said conduit system to heat said hydrogen gas before said hydrogen gas is communicated to said fuel cell.
- [c4] The system of claim 2 further comprising:
at least one sensor that is effective to measure at least one operating attribute and to generate a signal representing said at least one measured vehicle operating attribute; and
a controller which is communicatively coupled to said bypass valve and to said at least one sensor, said controller being effective to receive said signal and to selectively control said bypass valve based upon the value of said signal.
- [c5] The system of claim 4 wherein said at least one operating attribute comprises ambient air temperature.

- [c6] The system of claim 4 wherein said at least one operating attribute comprises a temperature of said fuel cell.
- [c7] The system of claim 4 wherein said at least one operating attribute comprises a temperature of said compressed air.
- [c8] A system for supplying air and hydrogen gas to a fuel cell within a vehicle, said system comprising:
a fuel tank which selectively stores said hydrogen gas;
a first conduit system which is adapted to be selectively and fluidly coupled said fuel tank to said fuel cell, effective to allow said hydrogen gas to be selectively communicated to said fuel cell;
a compressor which is effective to receive and compress said air;
a second conduit system which is adapted to be communicatively coupled to said compressor and to said fuel cell, said second conduit system being effective to receive said compressed air and to allow said compressed air to be selectively communicated to said fuel cell;
a first heat exchanger which is operatively disposed within said second conduit system and which is effective to selectively cool said compressed air before said compressed air is communicated to said fuel cell; and
at least one bypass valve which is operatively disposed within said second conduit system and which is effective to allow said compressed air to selectively bypass said first heat exchanger.
- [c9] The system of claim 8 further comprising:
a second heat exchanger which is operatively coupled to and receives hydrogen gas from said first conduit system and which is operatively coupled to and selectively receives compressed air that bypasses said first heat exchanger, effective to selectively heat said hydrogen gas.
- [c10] The system of claim 9 further comprising:
a controller which is communicatively connected to said bypass valve and which selectively actuates said bypass valve, effective to cause said compressed air to selectively bypass said first heat exchanger.
- [c11] The system of claim 10 further comprising:

at least one sensor that is effective to measure vehicle operating attributes and to generate signals representing said measured vehicle operating attributes; and wherein said controller is communicatively coupled to said at least one sensor and is effective to receive said signals and to selectively actuate said bypass valve based upon the value of said signals.

[c12] The system of claim 11 wherein said at least one sensor comprises a temperature sensor.

[c13] The system of claim 12 wherein said temperature sensor measures an ambient air temperature and said controller is effective to activate said bypass valve only if said measured ambient air temperature is less than a predetermined value representing a cold start condition.

[c14] The system of claim 12 wherein said temperature sensor measures a temperature of said fuel cell and said controller is effective to activate said bypass valve only if said measured temperature is less than a predetermined value.

[c15] The system of claim 10 wherein said bypass valve comprises a solenoid valve.

[c16] A method for heating a fuel cell stack within a vehicle having a compressor for selectively compressing air, an air conduit system which is communicatively coupled to and receives compressed air from said compressor and which is further communicatively coupled to said fuel cell stack, and a heat exchanger which is disposed within said air conduit system and which is effective to selectively cool said compressed air, said method comprising the steps of:
selectively causing said compressed air to bypass said heat exchanger and to be communicated directly to said fuel cell stack, thereby heating said fuel cell stack.

[c17] The method of claim 16 further comprising the steps of:
measuring an operating attribute;
selectively causing said compressed air to bypass said heat exchanger, based upon said measured operating attribute.

[c18] The method of claim 17 wherein said measured operating attribute comprises an ambient air temperature.

[c19] The method of claim 17 wherein said measured operating attribute comprises a

temperature of said compressed air.

[c20] The method of claim 17 wherein said operating attribute comprises a temperature of said fuel cell stack.

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